

Ultra-Radiation-Hardened Power Conversion, Phase I

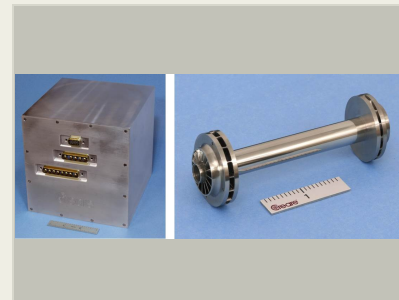
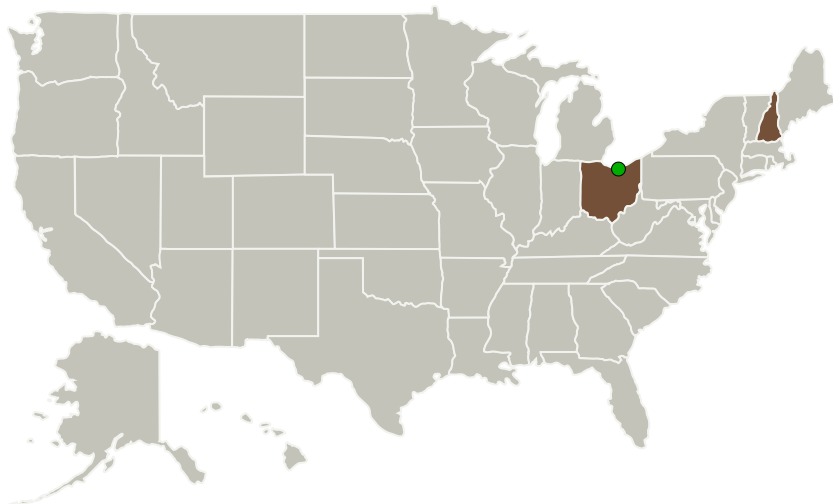
Completed Technology Project (2017 - 2017)



Project Introduction

Current designs for NASA fission power systems include relatively heavy shielding to protect the system components and payload from radiation emitted by the reactor. This shielding typically comprises over 35% of the power system mass. We propose to develop ultra-radiation-hardened power conversion technology to reduce shielding requirements for the converter and electronics so the large central shadow shield can be reduced or eliminated, in favor of smaller localized shields positioned to protect specific items that are sensitive. This work has great potential to reduce overall system mass significantly for Kilopower, Nuclear Electric Power (NEP), and Surface Power missions being considered by NASA. Consequently, these missions will become more practical and affordable to execute. Although we plan to focus on Brayton converters and electronics, the results will also apply to Stirling converters and their electronics. Creare is well-suited to succeed because we have a long history developing turbo-Brayton systems and radiation-hardened electronics for spaceflight applications. During the Phase I project, we will develop converter and electronics designs with radiation-hardened features, we will specify conceptual mission details, and we will optimize shielding mass. We will then fabricate and test prototype hardware during the Phase II project.

Primary U.S. Work Locations and Key Partners



Ultra-Radiation-Hardened Power Conversion, Phase I Briefing Chart Image

Table of Contents

| | |
|--|---|
| Project Introduction | 1 |
| Primary U.S. Work Locations and Key Partners | 1 |
| Images | 2 |
| Organizational Responsibility | 2 |
| Project Management | 2 |
| Technology Maturity (TRL) | 2 |
| Technology Areas | 3 |
| Target Destinations | 3 |

Ultra-Radiation-Hardened Power Conversion, Phase I

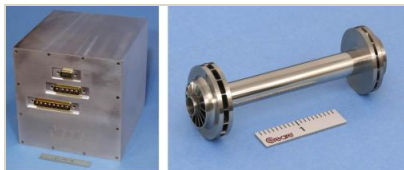
Completed Technology Project (2017 - 2017)



| Organizations Performing Work | Role | Type | Location |
|-------------------------------|-------------------------|-------------|------------------------|
| Creare LLC | Lead Organization | Industry | Hanover, New Hampshire |
| ● Glenn Research Center(GRC) | Supporting Organization | NASA Center | Cleveland, Ohio |

| Primary U.S. Work Locations | |
|-----------------------------|------|
| New Hampshire | Ohio |

Images



Briefing Chart Image

Ultra-Radiation-Hardened Power Conversion, Phase I Briefing Chart Image

(<https://techport.nasa.gov/image/131304>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Creare LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

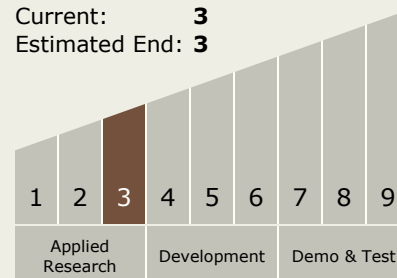
Carlos Torrez

Principal Investigator:

Jeffrey J Breedlove

Technology Maturity (TRL)

Start: 3
Current: 3
Estimated End: 3



Ultra-Radiation-Hardened Power Conversion, Phase I

Completed Technology Project (2017 - 2017)



Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.1 Power Generation and Energy Conversion
 - └ TX03.1.4 Dynamic Energy Conversion

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System